US009630697B2

(12) **United States Patent**
Yamada et al.

(10) **Patent No.: US 9,630,697 B2**
(45) **Date of Patent: Apr. 25, 2017**

(54) **OUTBOARD MOTOR**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/890,062**

(22) PCT Filed: **Apr. 9, 2015**

(86) PCT No.: **PCT/JP2015/061074**
§ 371 (c)(1),
(2) Date: **Nov. 9, 2015**

(87) PCT Pub. No.: **WO2015/163154**
PCT Pub. Date: **Oct. 29, 2015**

(65) **Prior Publication Data**

US 2016/0107738 A1 Apr. 21, 2016

(30) **Foreign Application Priority Data**

Apr. 24, 2014 (JP) 2014-089919
Jun. 3, 2014 (JP) 2014-114951

(51) **Int. Cl.**
F02B 61/04 (2006.01)
B63H 20/32 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B63H 20/32*** (2013.01); ***B63H 20/245*** (2013.01); ***F02B 61/045*** (2013.01); *F02M 35/167* (2013.01)

(58) **Field of Classification Search**
CPC B63H 20/32; B63H 20/245; F02B 61/045; F02B 61/04; F02B 67/00; F02M 35/167
See application file for complete search history.

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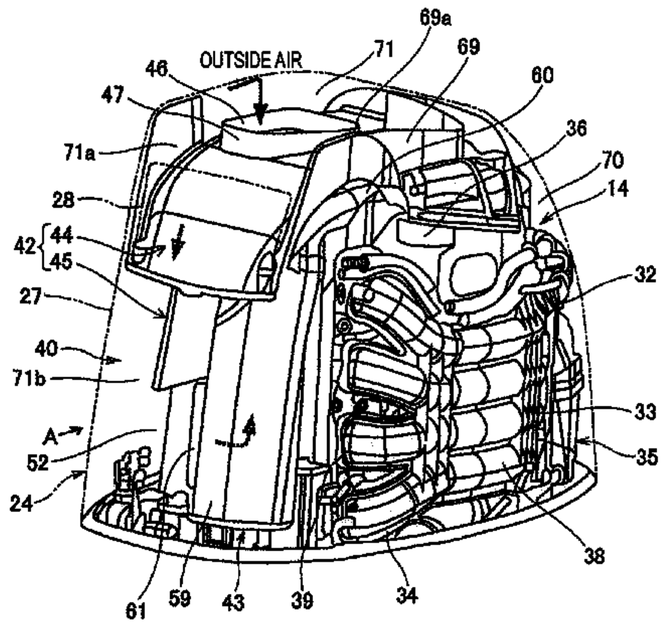
(57) **ABSTRACT**

[Problem] To perform an assembling operation easily while attaining improvement in engine efficiency.

[Solution] An outboard motor **10** according to the invention includes an upstream side duct **42** which is fixed to an engine upper cover **27**, and a downstream side duct **43** which is fixed to an engine **14** side. The upstream side duct **42** includes an exhaust port **52** which is opened at its side face. The downstream side duct **43** includes a downstream side lower duct **59** and a downstream side upper duct **60**. In the downstream side lower duct **59**, a suction port **61** is provided at a position opposed to the exhaust port **52** and separately at a predetermined distance from the exhaust port **52**. In the downstream side upper duct **60**, an exhaust port formed toward a throttle body **36** of the engine **14** is provided above the downstream side lower duct **59**. The upstream side duct **42** and the downstream side duct **43** are formed so as not to interfere with each other when the engine upper cover **27** is moved vertically.

7 Claims, 6 Drawing Sheets



(51) **Int. Cl.**
B63H 20/24 (2006.01)
F02M 35/16 (2006.01)

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FIG. 1

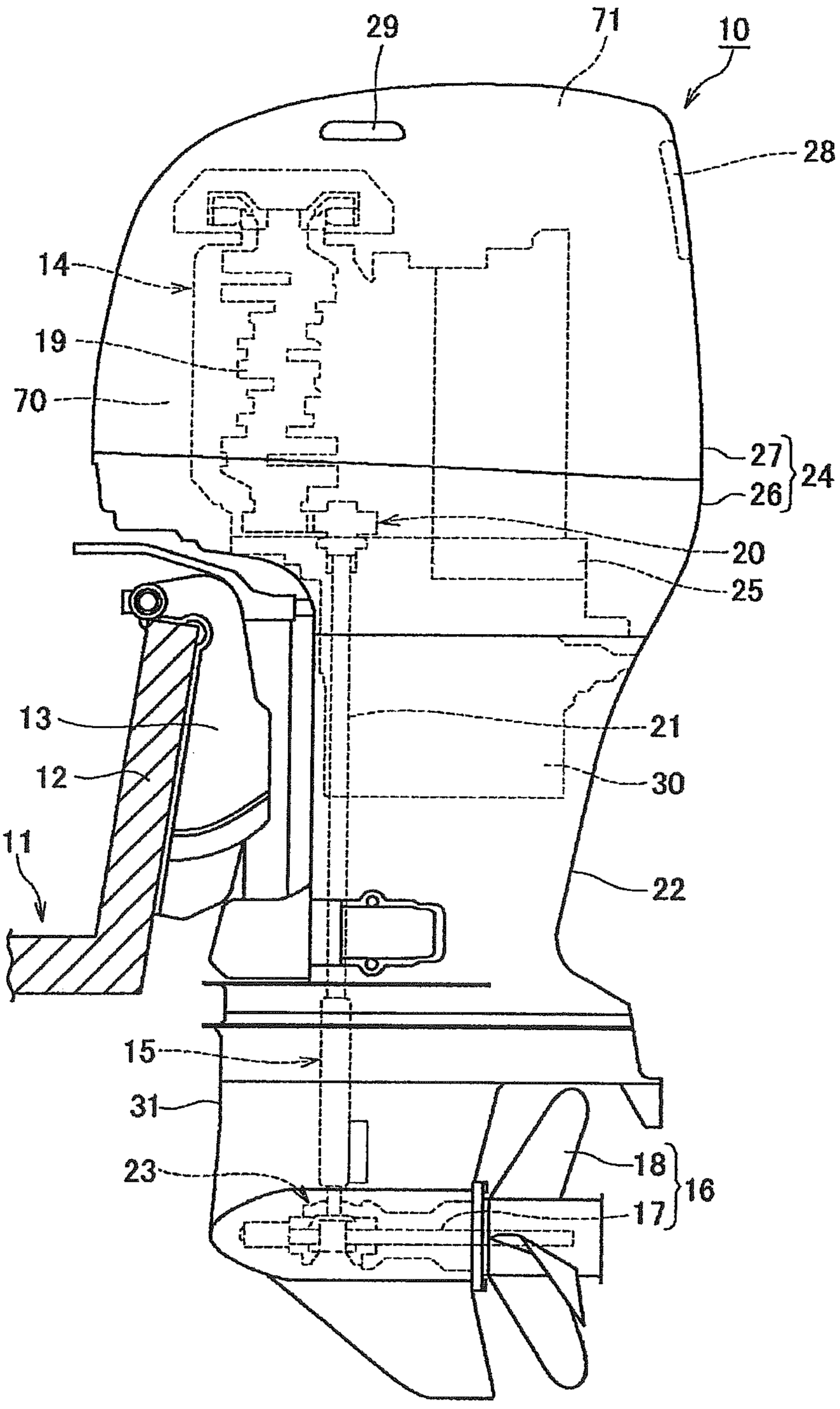
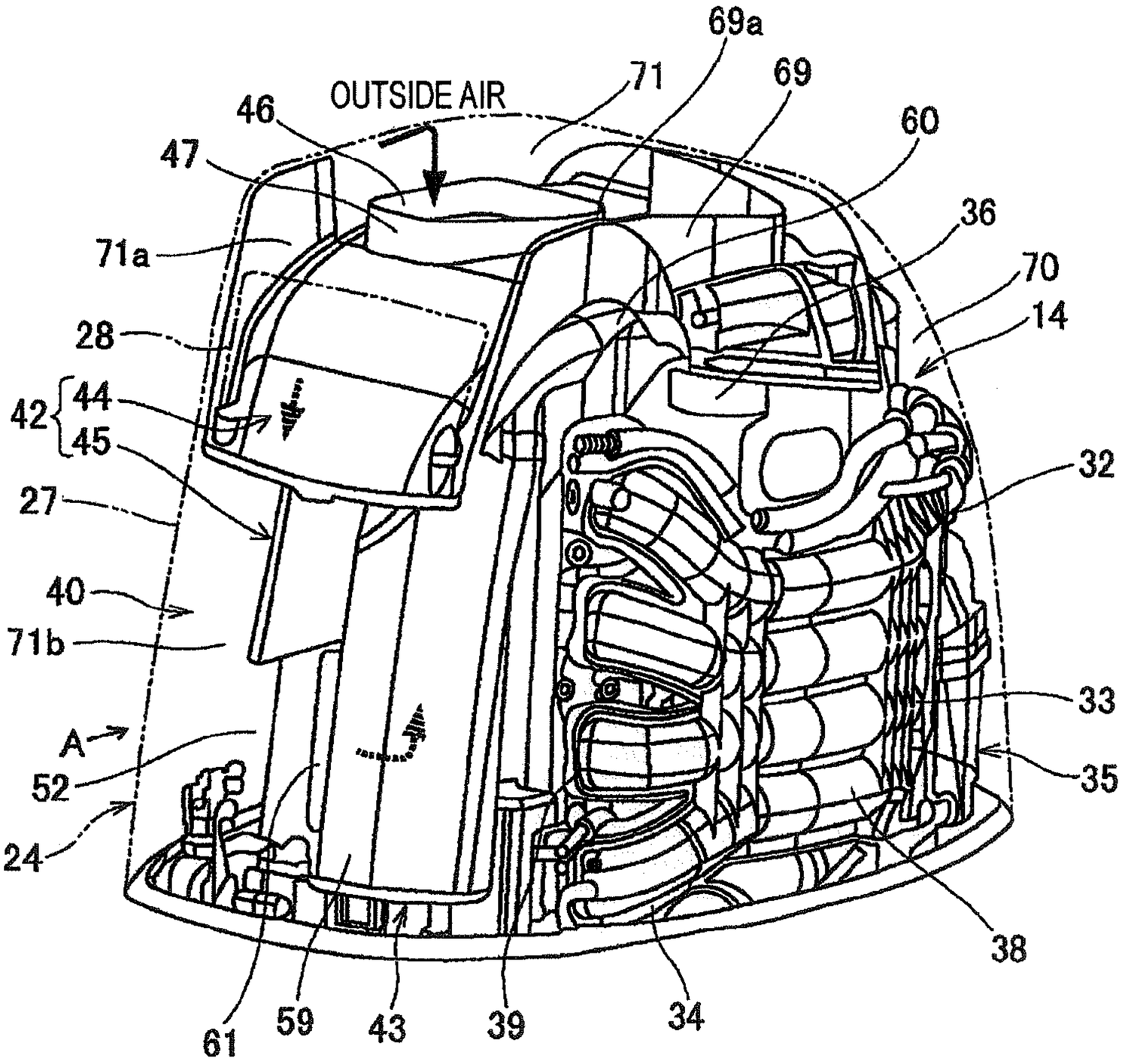


FIG. 2


69a
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71b
33
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FIG. 3

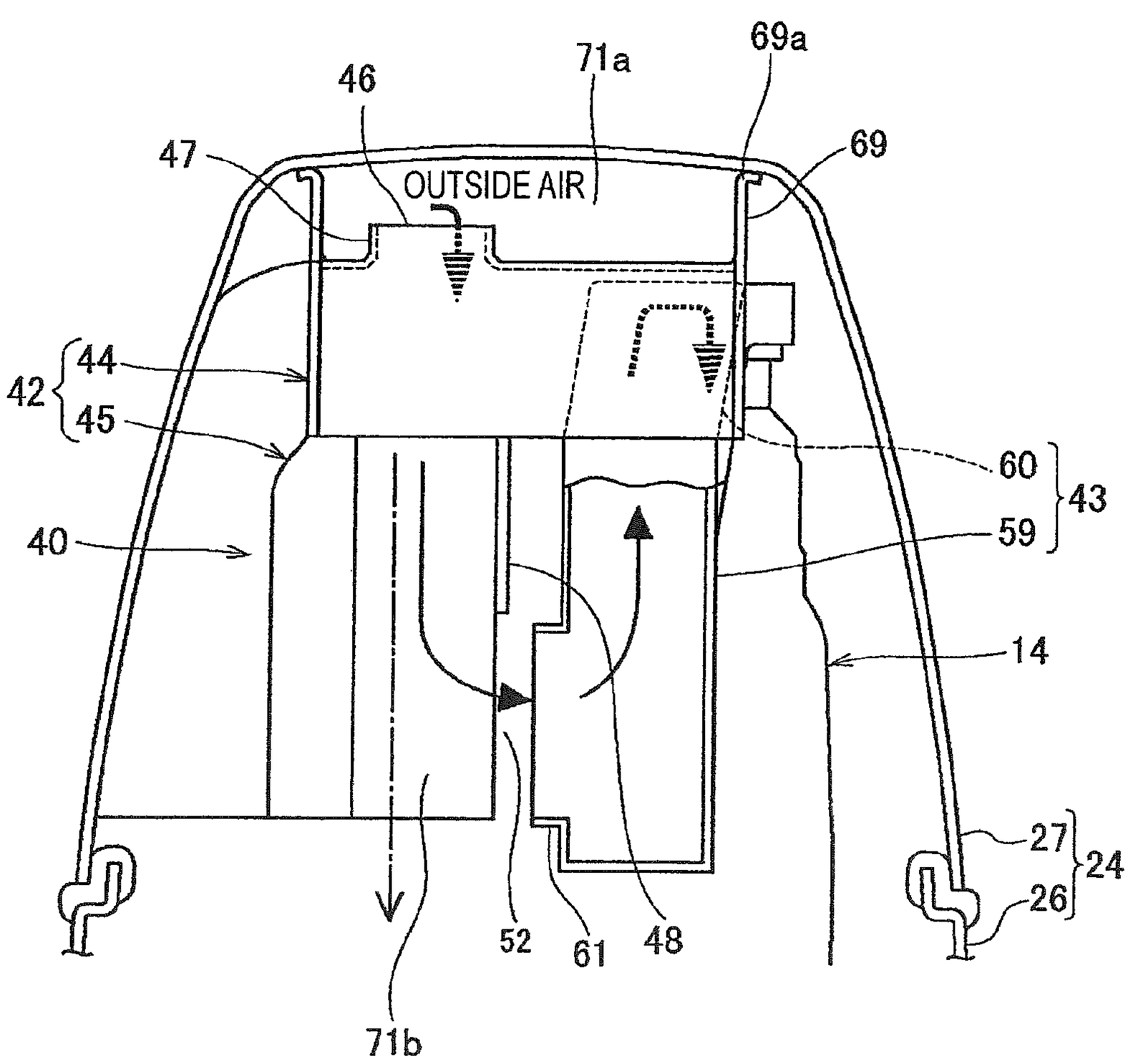
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FIG. 4

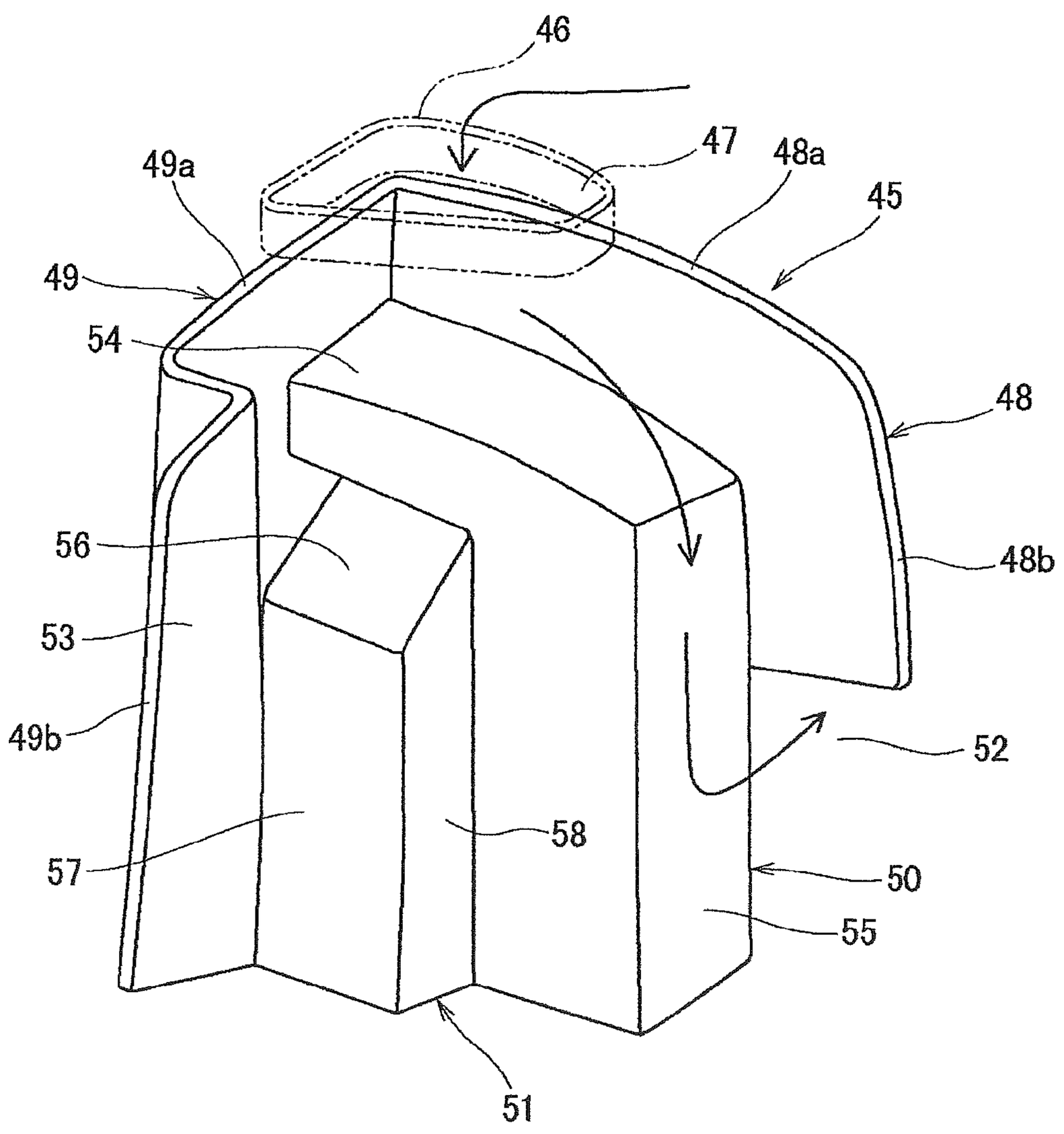

FIG. 5

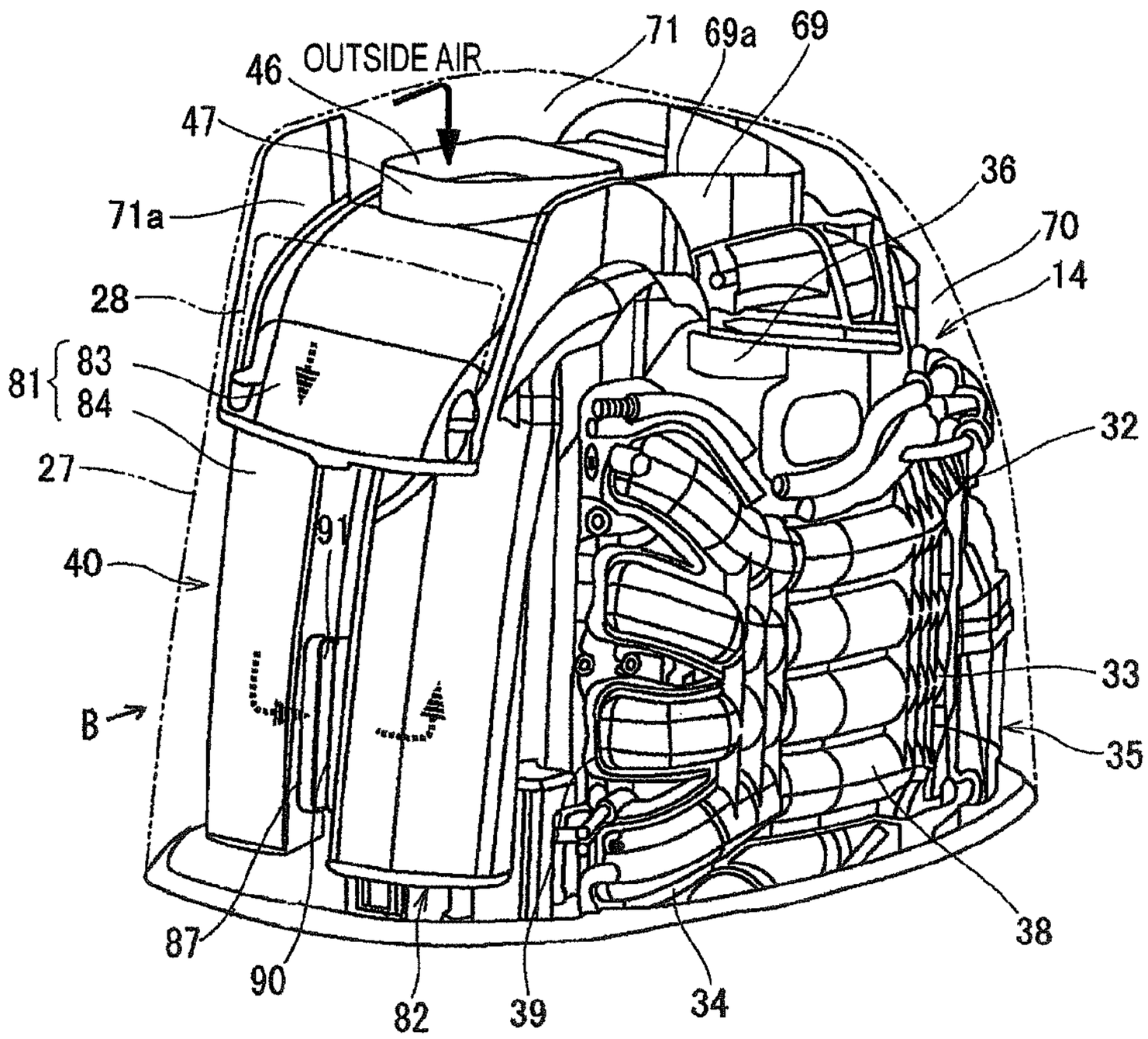
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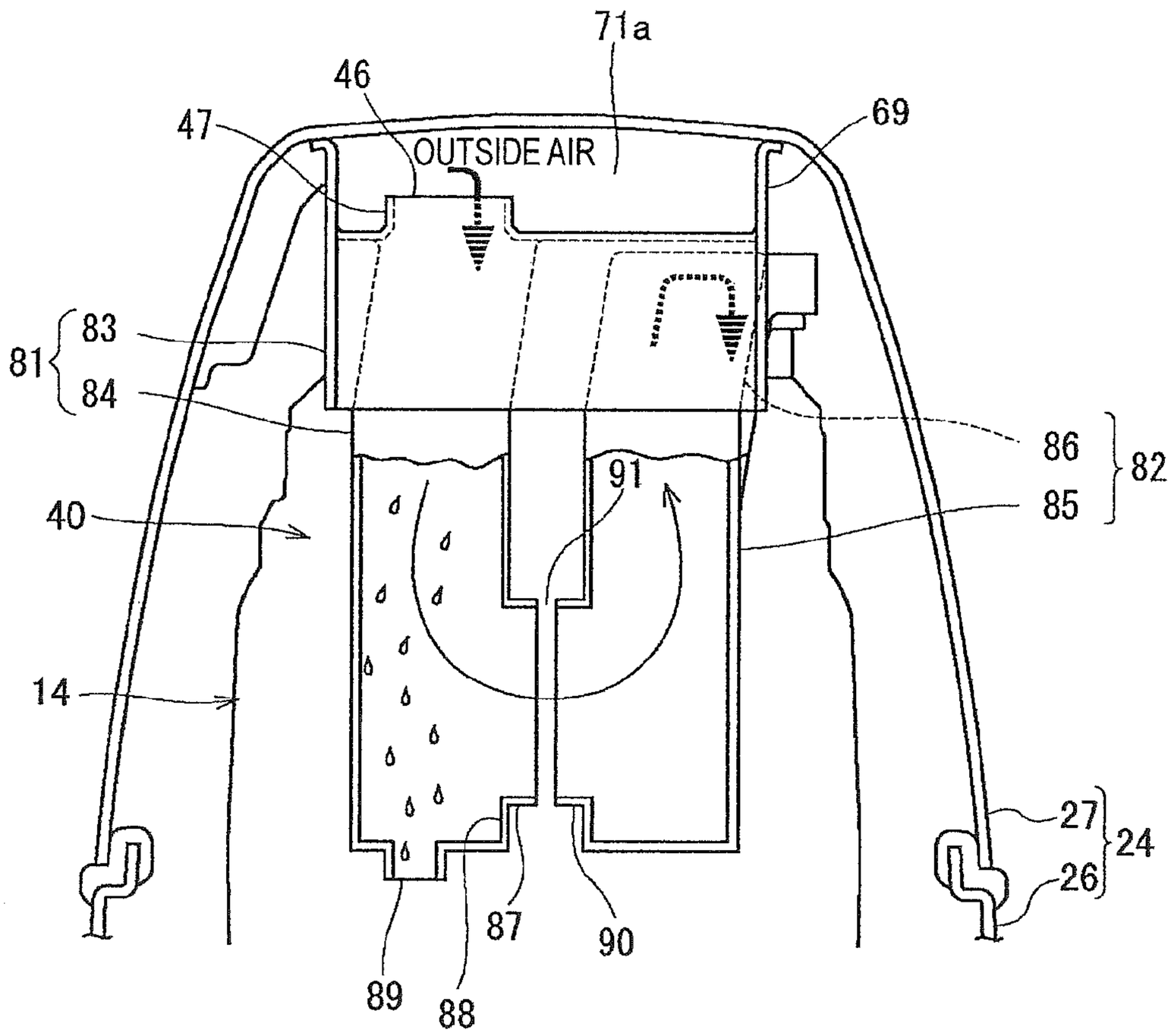
FIG. 6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OUTBOARD MOTOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a national stage of International Application No. PCT/JP2015/061074, filed Apr. 9, 2015, which claims the benefit of priority to Japanese Application No. 2014-089919, filed Apr. 24, 2014, and Japanese Application No. 2014-114951, filed Jun. 3, 2014, in the Japanese Patent Office, the disclosures of which are incorporated herein by reference.

TECHNICAL FIELD

The present invention relates to an outboard motor including an intake pathway by which air sucked from the outside is guided to a throttle body inside an engine cover.

BACKGROUND ART

Generally, an engine has such a characteristic that the output of the engine increases as the intake temperature of the engine decreases. Therefore, an opening portion for introducing outside air is provided in an engine cover in the case of an outboard motor in which the engine is covered with the engine cover.

However, when such an opening portion is simply provided at the engine cover, there is a fear that air sucked inside the engine cover through the opening portion may become high in temperature due to heat generated by the engine to thereby increase the intake temperature of the engine.

Therefore, in the background art, there is proposed an outboard motor provided with an intake device. The intake device is provided with left and right intake passages by which air introduced into the inside of the outboard motor through the opening portion of the engine cover is guided to a throttle body, and left and right interference type silencers which are provided in the middle of the intake passages respectively (e.g. see Patent Literatures 1 and 2).

PRIOR ART DOCUMENTS

Patent Literature

Patent Literature 1: JP-A-2007-69823
Patent Literature 2: JP-A-2013-96342

SUMMARY OF INVENTION

Problems to be Solved by the Invention

However, in the aforementioned outboard motor described in any of Patent Literatures 1 and 2, the intake device has a complicated structure. For this reason, there is a problem that it may take time and labor to perform an outboard motor assembling operation and it may be difficult to miniaturize the outboard motor.

In addition, in the case where water spray, rainwater, etc. during sailing using the outboard motor enters the intake device through the opening portion for introducing outside air, it is difficult to drain the water. Therefore, there is also a problem that corrosion may occur easily inside the engine.

The invention has been accomplished in order to solve the aforementioned problems. An object of the invention is to provide an outboard motor for which an outboard motor assembling operation can be performed easily while efficiency of an engine is improved, and which can be miniaturized and suppress corrosion inside the engine.

Means for Solving the Problems

In order to achieve the aforementioned object, the invention provides an outboard motor including: an intake pathway by which air sucked from the outside into an intake space inside an engine cover through an outside air intake port provided at the engine cover covering an engine is guided to a throttle body of the engine, wherein: the engine cover is formed to be able to be split into an engine lower cover and an engine upper cover in an up/down direction; the intake pathway includes an upstream side duct and a downstream side duct, the upstream side duct being fixed to the engine upper cover of the engine cover so that air can circulate downward in the upstream side duct, the downstream side duct being fixed to the engine side in parallel with the upstream side duct so that air can circulate upward in the downstream side duct; the upstream side duct includes an exhaust port which is opened at its side face; the downstream side duct includes a downstream side lower duct and a downstream side upper duct, the downstream side lower duct extending upward so as to form an air ascending flow, the downstream side lower duct including a suction port provided at a position opposed to the exhaust port and separately at a predetermined distance from the exhaust port, the downstream side upper duct being formed toward the throttle body of the engine above the downstream side lower duct, the downward side upper duct including an exhaust port communicating with the throttle body; and the upstream side duct and the downstream side duct are formed so as not to interfere with each other when the engine upper cover of the engine cover is moved vertically.

In addition, in the outboard motor according to the invention, the upstream side duct is formed by: an upstream side upper duct which is fixed to an upper portion of the engine upper cover to thereby form an upper space; and an upstream side lower duct which is fixed to a lower face of the upstream side upper duct to thereby form an air descending flow space between the upstream side lower duct and the engine upper cover, and which includes the exhaust port opened at its side face.

In addition, in the outboard motor according to the invention, the upstream side duct includes: an upstream side upper duct which is fixed to an upper portion of the engine upper cover to form an upper space; and an upstream side lower duct which is formed below the upstream side upper duct to extend downward to a rear lower portion of the engine; an upper suction port which communicates with the outside air intake port through the intake space is formed at the upstream side upper duct; and the exhaust port is provided at the side face of the upstream side lower duct.

By use of such a configuration, the upstream side duct and the downstream side duct can be prevented from making contact with each other when the engine upper cover of the engine cover is attached or detached. Accordingly, an outboard motor assembling operation can be simplified and the intake pathway can be formed easily inside the engine cover. In addition, outside air can be guided directly to the throttle body of the engine through the intake pathway. Accordingly, the intake temperature of the engine can be reduced so that the output of the engine can be increased.

In addition, in the outboard motor according to the invention, preferably, a lower end of the upstream side duct is opened downward.

By use of such a configuration, even when, for example, water drops of water spray, rainwater, etc. during Sailing directly enter the intake pathway or air including water enters the intake pathway from the outside, the water separated from the air or the water drops can be surely discharged to the outside from the lower end of the upstream side duct. Accordingly, water drops or water can be prevented from entering the engine and occurrence of corrosion inside the engine can be suppressed.

In addition, in the outboard motor according to the invention, it is preferable that the upper suction port is opened upward, a rising portion is formed to surround the upper suction port, and the upstream side upper duct is formed to be slanted downward to the outside air intake port.

By use of such a configuration, water can be separated from outside air either before the air is introduced into the intake pathway or in the intake pathway so that the water can be drained to the outside. Therefore, the water can be prevented from entering the engine. Accordingly, occurrence of corrosion inside the engine can be suppressed.

Advantageous Effects of Invention

According to the invention, it is possible to obtain various excellent effects that an outboard motor assembling operation can be performed easily while improvement in efficiency of the engine is attained, miniaturization can be achieved, an effect that corrosion inside the engine can be suppressed, etc.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** A side view showing an outboard motor according to an embodiment of the invention.

FIG. **2** A perspective view showing the outboard motor according to a first embodiment of the invention.

FIG. **3** A view taken along an arrow A of FIG. **2**.

FIG. **4** A perspective view showing an upstream side lower duct of the outboard motor according to the first embodiment of the invention.

FIG. **5** A perspective view showing an outboard motor according to a second embodiment of the invention.

FIG. **6** A view taken along an arrow B of FIG. **5**.

EMBODIMENTS FOR CARRYING OUT THE INVENTION

An outboard motor according to an embodiment of the invention will be described below with reference to the drawings. Incidentally, in the following description, directions toward the front, the rear, the left and the right will be indicated based on moving directions of a hull.

First, an overall configuration of an outboard motor **10** according to the embodiment of the invention will be described with reference to FIG. **1**. Here, FIG. **1** is a side view showing the outboard motor **10** according to the embodiment of the invention.

As shown in FIG. **1**, the outboard motor **10** is attached to a transom **12** of a hull **11** through an attachment bracket **13** so as to be rotatable in an up/down direction. The outboard motor **10** is provided with an engine **14**. The output from the engine **14** is transmitted to a propulsion machine **16** through a power transmission device **15**. The propulsion machine **16** is provided with a propeller shaft **17** and a propeller **18**. The engine output is transmitted to the propeller shaft **17**. The propeller **18** is fixed to the propeller shaft **17**.

The engine **14** is a vertical type four-cylinder engine inside which a crankshaft **19** is disposed substantially vertically. The engine output is extracted from a lower end of the crankshaft **19**. The lower end portion of the crankshaft **19** is connected to an upper end portion of a driveshaft **21** through a primary gear device **20**. The driveshaft **21** extends substantially vertically downward inside a main body housing **22**. A lower end portion of the driveshaft **21** is connected to the propeller shaft **17** through a bevel gear device **23**. The power transmission device **15** is constituted by the primary gear device **20**, the driveshaft **21** and the bevel gear device **23**.

An engine cover **24** is provided in an upper portion of the main body housing **22** liquid-tightly. The inside of the engine cover **24** is roughly divided into an engine room **70** and an intake space **71**. The intake space **71** is formed to extend over the rear of the engine room **70** from an upper side of the engine room **70**. The engine **14** and an engine holder **25** are received in the engine room **70**. The engine **14** is attached to an upper portion of the engine holder **25**.

An engine lower cover **26** and an engine upper cover **27** are assembled into the engine cover **24** liquid-tightly so that the engine cover **24** can be split into two in an up/down direction. The engine holder **25** is received inside the engine lower cover **26**. The attachment bracket **13** is mounted on the engine holder **25**. An outside air intake port **28** is opened at a rear-side upper portion of the engine upper cover **27**. An exhaust port **29** is opened at a left-side upper portion of the engine upper cover **27**.

An oil pan **30** is provided below the engine holder **25**. The oil pan **30** is received inside the main body housing **22**. The driveshaft **21** of the power transmission device **15** is received in the main body housing **22** to be insertable in a longitudinal direction. A gear casing **31** is provided in a lower portion of the main body housing **22** liquid-tightly. The bevel gear device **23** is stored inside the gear casing **31**.

Next, the configuration of the outboard motor **10** inside the engine cover **24** according to a first embodiment of the invention will be described with reference to FIGS. **2** to **4**. Here, FIG. **2** is a perspective view showing the outboard motor according to the first embodiment of the invention. FIG. **3** is a view taken along an arrow A of FIG. **2**. FIG. **4** is a perspective view showing an upstream side lower duct of the outboard motor according to the first embodiment of the invention.

As shown in FIG. **2**, the engine **14** is provided with an engine block **35** including a crankcase **32**, a cylinder block **33** and a cylinder head **34**. The crankcase **32** is disposed in a front portion of the engine **14**. The cylinder block **33** is provided integrally with the rear of the crankcase **32**. The cylinder head **34** is provided integrally with the rear of the cylinder block **33**. A throttle body **36** for supplying a fuel-air mixture to respective cylinders of the cylinder block **35** is provided in the engine **14**. Intake manifolds **38** are connected from the throttle body **36** to air intake ports **39**. The air intake ports **39** extend in accordance with the respective cylinders and are formed in the cylinder head **34**.

As exactly shown in FIG. **3**, an intake pathway **40** which is formed into a U-shape when viewed from the back is formed in the intake space **71** inside the engine cover **24**. The intake pathway **40** is provided with the engine cover **24**, an upstream side duct **42** and a downstream side duct **43**. The upstream side duct **42** is fixed to the engine cover **24** so that air can circulate downward in the upstream side duct **42**. The downstream side duct **43** is fixed to the engine **14** side in parallel with the upstream side duct **42** so that air can

circulate upward in the downstream side duct **43**. A lower end of the upstream side duct **42** is opened.

As shown in FIGS. **2** to **4**, the upstream side duct **42** is provided with an upstream side upper duct **44** and an upstream side lower duct **45**. The upstream side upper duct **44** is formed to cover a rear portion of the engine **14** from above, and to be slanted downward to the outside air intake port **28** so as to partition an upper space **71***a* of the intake space **71**. The upstream side lower duct **45** is fixed to a lower face of the upstream side upper duct **44** so that an air descending flow space **71***b* can be formed between the engine cover **24** and the upstream side lower duct **45**.

An upper suction port **46** is opened upward in the upstream side upper duct **44**. A rising portion **47** is formed to surround the upper suction port **46**. The upper suction port **46** and the outside air intake port **28** communicate with each other through the upper space **71***a* of the intake space **71**. In addition, a partition plate **69** is provided erectly on a front edge portion and left and right edge portions of the upstream side upper duct **44**. An upper end **69***a* of the partition plate **69** has a shape following an inner face of the engine upper cover **27** and is fixed to the inner face of the engine upper cover **27** through a seal.

As exactly shown in FIG. **4**, a right side face **48** and a front face **49** are formed in the upstream side lower duct **45**. The right side face **48** is formed to be opposed to the downstream side duct **43**. The front face **49** is bent leftward from a front end portion of the right side face **48** substantially at right angles. In addition, a first bulge portion **50** and a second bulge portion **51** are formed stepwise in the upstream side lower duct **45** so as to avoid interference with the engine **14**. The first bulge portion **50** is provided protrusively on a left side of the right side face **48**. The second bulge portion **51** is provided on a further left side of the first bulge portion **50**.

A lower portion of a rear end of the right side face **48** is opened to form an exhaust port **52**. An upper end **48***a* of the right side face **48** has a shape following an inner face of the upstream side upper duct **44**. In addition, the rear end **48***b* of the right side face **48** has a shape following an inner face of the edge upper cover **27** and is fixed to the inner face of the engine upper cover **27** through a seal.

A left end portion **53** of the front face **49** is formed into a crank shape to be bent rearward. An upper end **49***a* of the front face **49** has a shape following the inner face of the upstream side upper duct **44**. In addition, a left end **49***b* of the front face **49** has a shape following the inner face of the engine upper cover **27** and is fixed to the inner face of the engine upper cover **27** through a seal.

The first bulge portion **50** is formed into a box shape which is flat in a left/right direction. An upper face **54** of the first bulge portion **50** extends along the right side face **48** in a front/rear direction, and is slanted slightly downward to the rear. A front portion of the upper face **54** is disposed below the upper suction port **46** of the upstream side upper duct **44**. A rear face **55** of the first bulge portion **50** extends in an up/down direction and disposed in front of the exhaust port **52** of the right side face **48**.

The second bulge portion **51** is formed into a vertically long box shape. An upper face **56** of the second bulge portion **51** is formed below the upper face **54** of the first bulge portion **50** and slanted downward to the left. A left side face **57** of the second bulge portion **51** is disposed on a right side of the left end **49***b* of the front face **49**. A rear face **58** of the second bulge portion **51** is disposed in front of the rear face **55** of the first bulge portion **50**.

Refer to FIGS. **2** and **3** again. The downstream side duct **43** has a flat shape extending from a rear lower right portion of the engine **14** to bend toward an upper right side of the engine **14**. The downstream side duct **43** also functions as a silencer. The downstream side duct **43** is provided with a downstream side lower duct **59** and a downstream side upper duct **60**. The downstream side lower duct **59** extends upward from the rear lower portion of the engine **14** so as to form an air ascending flow. The downstream side upper duct **60** is formed above the downstream side lower duct **59** and below the upstream side upper duct **44** to extend toward the throttle body **36** of the engine **14**.

A suction port **61** formed into a vertically long shape is provided in a left side face of the downstream side lower duct **59** to protrude leftward in a position opposed to the exhaust port **52** of the upstream side duct **42**. The suction port **61** is separated at a predetermined distance from the exhaust port **52**. An exhaust port (not shown) is formed in the downstream side upper duct **60**, and the exhaust port is connected to an intake port of the throttle body **36**. When the upstream side duct **42** and the downstream side duct **43** are formed thus, the upstream side lower duct **45** and the downstream side lower duct **59** can be prevented from overlapping with each other in plan view.

Next, the flow of air in the outboard motor **10** having the aforementioned configuration inside the engine cover **14** during running will be described with reference to FIGS. **2** to **4**.

When the engine **14** starts up, first, outside air flows into the inside of the engine cover **24** through the outside air intake port **28**. The air passes through the upper space **71***a* of the intake space **71** and is then sucked into the descending flow space **71***b* through the upper suction port **46**. On this occasion, water spray entering through the outside air intake port **28** or water contained in the air collides against the rising portion **47** of the upper suction port **46** so as to be separated from the air. Thus, the water can be prevented from flowing into the descending flow space **71***b*. In addition, the water separated by the rising portion **47** of the upper suction port **46** can be not only prevented by the partition plate **69** from falling down from the upper space **71***a* into the descending flow space **71***b* but also discharged to the outside from the outside air intake port **28** in accordance with the slope of the upstream side upper duct **44**.

Then, the air sucked into the descending flow space **71***b* of the upstream side duct **42** descends mainly along the upper face **54** and the rear face **55** of the first bulge portion **50**. At a lower end of the first bulge portion **50**, the air changes the direction of its flow to a direction toward the exhaust port **52** side so that the air can be emitted from the exhaust port **52** toward the suction port **61** of the downstream side duct **43**. On this occasion, water in the air is separated by collusion against the first bulge portion **50** or by a centrifugal force when the air changes the direction of its flow. The separated water is surely discharged outside the upstream side duct **42** from the opening at the lower end of the upstream side duct **42**, as designated by a one-dot chain line in FIG. **3**.

The air from which the water has been separated thus is emitted from the exhaust port **52** and flows into the downstream side duct **43** through the suction port **61**. Then, the air ascends inside the first duct **59** of the downstream side duct **43**, passes through the fourth duct **60**, and is sucked into the intake port of the throttle body **36**. Then, the air is supplied to the respective cylinders of the engine **14** through the intake manifolds **38** respectively.

According to the outboard motor **10** according to the aforementioned embodiment of the invention, the upstream side lower duct **45** fixed to the engine cover **24** and the downstream side lower duct **59** fixed to the engine **14** side are formed in parallel with each other and the downstream side upper duct **60** is formed below the upstream side upper duct **44**. Further, the exhaust port **52** and the suction port **61** are provided separately from each other so that the upstream side lower duct **45** and the downstream side lower duct **59** can be prevented from overlapping with each other in plan view. With these configurations, the upstream side duct **42** and the downstream side duct **43** can be prevented from interfering with each other when the engine upper cover **27** of the engine cover **24** is attached or detached. Accordingly, an operation of assembling the outboard motor **10** can be simplified. The intake pathway **40** can be formed easily inside the engine cover **24**.

Before outside air is introduced into the throttle body **36** of the engine **14** or the engine room **70**, air-water separation is performed in the rising portion **47** of the upper suction port **46**. Accordingly, entry of water into the throttle body **36** of the engine **14** or the engine room **70** can be suppressed.

Further, for example, even when water drops of water spray, rainwater, etc. during sailing directly enters the intake pathway **40** or air containing water enters the intake pathway **40** through the outside air intake port **28**, the water drops or the water can be drained easily from an opening at the lower end of the upstream side duct **42**. Accordingly, the water drops or the water can be prevented from entering the engine **14** so that occurrence of corrosion inside the engine **14** can be suppressed.

Further, outside air can be introduced directly into the throttle body **36** of the engine **14** through the intake pathway **40**. Accordingly, the intake temperature of the engine **14** can be reduced so that the output of the engine **14** can be increased.

Further, the intake pathway **40** is formed in the intake space **71** which is formed to extend over the rear of the engine room **70** from the upper side of the engine room **70**. Accordingly, the dimensions of the engine cover **24** can be suppressed to the minimum so that the increase of the size of the outboard motor can be prevented.

Incidentally, in the aforementioned embodiment of the invention, the upstream side lower duct **45** and the downstream side lower duct **59** are formed so as not to overlap with each other in plan view. However, there is no intension to limit the invention to the embodiment. That is, various modifications can be made as long as the upstream side duct **42** and the downstream side duct **43** can be formed so as not to interfere with each other when the engine cover **24** is moved vertically to be attached/detached. For example, the lower end of the right side face **48** may be disposed above the suction port **61** of the downstream side duct **43** and the right side face **48** of the upstream side lower duct **45** may be formed so as to overlap with the suction port **61** in plan view.

Next, a configuration of an outboard motor **10** inside an engine cover **24** according to a second embodiment of the invention will be described with reference to FIGS. **5** and **6**. Here, FIG. **5** is a perspective view showing the outboard motor according to the second embodiment of the invention. FIG. **6** is a view taken along an arrow B of FIG. **5**. Incidentally, in the following description, equivalent constituents in FIGS. **5** and **6** to those in the aforementioned first embodiment will be referred to by the same numerals or signs as those in FIGS. **2** to **4** respectively in order to simplify explanation, and detailed description of those constituents will be omitted.

As exactly shown in FIG. **6**, an intake pathway **40** which is formed into a U-shape when viewed from the back is formed in an intake space **71** inside the engine cover **24**. The intake pathway **40** is provided with an upstream side duct **81** and a downstream side duct **82**. The upstream side duct **81** is fixed to the engine cover **24** and formed to extend downward so that cir can circulate downward in the upstream side duct **81**. The downstream side duct **82** is fixed to an engine **14** and formed to extend upward and in parallel with the upstream side duct **81** so that air can circulate upward in the downstream side duct **82**.

The upstream side duct **81** is provided with an upstream side upper duct **83** and an upstream side lower duct **84**. The upstream side upper duct **83** is formed to cover a rear portion of the engine **14** from above and provided to be slanted downward to an outside air intake port **28**. The upstream side lower duct **84** is connected to a lower side of the upstream side upper duct **83**, and formed into a flat shape to extend from an upper left side of the engine **14** and bend toward a rear lower left portion of the engine **14**.

An upper suction port **46** is opened upward in an upper portion of the upstream side upper duct **83**. A rising portion **47** is formed to surround the upper suction port **46**. The upper suction port **46** and the outside air intake port **28** communicate with each other through an upper space **71***a* of the intake space **71**. In addition, a partition plate **69** is provide erectly on a front edge portion and left and right edge portions of the upstream side upper duct **83**. An upper end of the partition plate **69** has a shape following an inner face of an engine upper cover **27**.

An exhaust port **87** formed into a vertically long shape is provided to protrude rightward in a right side face of a lower portion of the upstream side lower duct **84**. A step portion **88** is formed under the exhaust port **87**. A water drainage hole **89** is opened at the bottom of a lower end of the upstream side lower duct **84**.

The downstream side duct **82** has a flat shape extending from a rear lower right portion of the engine **14** and bending toward an upper right side of the engine **14**. The downstream side duct **82** also functions as a silencer. The downstream side duct **82** is provided with a downstream side lower duct **85** and a downstream side upper duct **86**. The downstream side lower duct **85** is formed in parallel with the upstream side lower duct **84** and extends upward from the rear lower portion of the engine **14**. The downstream side upper duct **86** is formed above the downstream side lower duct **85** and below the upstream side upper duct **83** to extend toward a throttle body **36** of the engine **14**.

A suction port **90** which is formed into a vertically long shape is provided in a left side face of the downstream side lower duct **85** to protrude leftward in a position opposed to the exhaust port **87** of the upstream side duct **81**. The suction port **90** is separated at a predetermined distance from the exhaust port **87**. An open portion **91** is formed to be vertically long between the exhaust port **87** and the suction port **90**. In addition, an exhaust port (not shown) is formed in the downstream side upper duct **86**, and the exhaust port is connected to an intake port of the throttle body **36**. When the upstream side duct **81** and the downstream side duct **82** are formed thus, the upstream side lower duct **84** and the downstream side lower duct **85** can be prevented from overlapping with each other in plan view.

Next, the flow of air in the outboard motor **10** having the aforementioned configuration inside the engine cover **14** during running will be described with reference to FIGS. **5** and **6**.

When the engine **14** starts up, first, outside air flows into the inside of the engine cover **24** through the outside air intake port **28**. The air passes through the upper space **71***a* of the intake space **71** and is then sucked into the upstream side lower duct **84** through the upper suction port **46**. On this occasion, water spray entering through the outside air intake port **28** or water contained in the air collides against a rising portion **47** of the upper suction port **46** so as to be separated from the air. Thus, the water can be prevented from flowing into the upstream side lower duct **84**. In addition, the water separated by the rising portion **47** of the upper suction port **46** can be not only prevented by the partition plate **69** from falling down from the upstream side upper duct **83** into the engine room **70** below the partition plate **69** but also discharged to the outside from the outside air intake port **28** in accordance with the slope of the upstream side upper duct **83**.

Then, the air sucked into the upstream side lower duct **84** descends inside the upstream side lower duct **84**. At the lower end of the upstream side lower duct **84**, the air changes the direction of its flow to a direction toward the exhaust port **87** side so that the air can be emitted from the exhaust port **87** toward the suction port **90** of the downstream side duct **82**. On this occasion, water in the air is separated by a centrifugal force when the air changes the direction of its flow and by collusion against the step portion **87**. The separated water is surely discharged outside the upstream side lower duct **84** from the water drainage hole **89**.

The air from which the water has been separated thus is emitted from the exhaust port **87** and flows into the downstream side duct **82** through the suction port **90**. Then, the air ascends inside the downstream side lower duct **85**, passes through the downstream side upper duct **86**, and is sucked into the intake port of the throttle body **36**. Then, the air is supplied to the respective cylinders of the engine **14** through the intake manifolds **38** respectively.

According to the outboard motor **10** according to the aforementioned embodiment of the invention, the upstream side lower duct **84** fixed to the engine cover **24** and the downstream side lower duct **85** fixed to the engine **14** side are formed in parallel with each other, and the downstream side upper duct **86** is formed below the upstream side upper duct **83**. Further, the exhaust port **87** and the suction port **90** are provided separately from each other so that the upstream side lower duct **84** and the downstream side lower duct **85** can be prevented from overlapping with each other in plan view. Thus, the upstream side duct **41** and the downstream side duct **42** can be prevented from making contact with each other when the engine upper cover **27** of the engine cover **24** is attached or detached. Accordingly, an operation of assembling the outboard motor **10** can be simplified. The intake pathway **40** can be formed easily inside the engine cover **24**.

Before outside air is introduced into the throttle body **36** of the engine **14** or the engine room **70**, air-water separation is performed in the rising portion **47** of the upper suction port **46**. Accordingly, entry of water into the throttle body **36** of the engine **14** or the engine room **70** can be suppressed.

Further, for example, even when water drops of water spray, rainwater, etc. during sailing directly enter the intake pathway **40** or air containing water enters the intake pathway **40** through the outside air intake port **28**, air and water can be separated from each other surely at the lower end of the upstream side lower duct **84** so that the water drops or the water generated thus can be drained easily from the water drainage hole **89**. Accordingly, the water drops or the water can be prevented from entering the engine **14** so that occurrence of corrosion inside the engine **14** can be suppressed.

Further, outside air can be directly guided to the throttle body **36** of the engine **14** through the intake pathway **40**. Accordingly, the intake temperature of the engine **14** can be reduced so that the output of the engine **14** can be increased.

Further, the intake pathway **40** is formed in the intake space **71** which is formed to extend over the rear of the engine room **70** from the upper side of the engine room **70**. Accordingly, the dimensions of the engine cover **24** can be suppressed to the minimum so that the increase of the size of the outboard motor can be prevented.

Incidentally, the aforementioned embodiments of the invention have been described as preferred embodiments in the outboard motor according to the invention. Accordingly, various technically preferable limitations may be given but there is no intension to limit the technical scope of the invention to these forms as long as there is no particular description for limiting the invention. That is, constituent elements in the aforementioned embodiments of the invention can be replaced by existing constituent elements etc. suitably and various variations including other combinations with the existing constituent elements can be made. Description about the aforementioned embodiments of the invention does not limit the contents of the invention described in the scope of Claims.

REFERENCE SIGNS LIST

10 outboard motor
14 engine
24 engine cover
26 engine lower cover
27 engine upper cover
28 outside air intake port
36 throttle body
40 intake pathway
42 upstream side duct
43 downstream side duct
44 upstream side upper duct
45 upstream side lower duct
46 upper suction port
47 rising portion
52 exhaust port
59 downstream side lower duct
60 downstream side upper duct
61 suction port
71 intake space
71*a* upper space
71*b* descending flow space
81 upstream side duct
82 downstream side duct
83 upstream side upper duct
84 upstream side lower duct
85 downstream side lower duct
86 downstream side upper duct
87 exhaust port
89 water drainage hole
90 suction port

The invention claimed is:

1. An outboard motor comprising: an intake pathway by which air sucked from outside into an intake space inside an engine cover through an outside air intake port provided at the engine cover covering an engine is guided to a throttle body of the engine, wherein:

the engine cover is formed to be able to be split into an engine lower cover and an engine upper cover in an up and down direction;

the intake pathway comprises an upstream side duct and a downstream side duct, the upstream side duct being fixed to the engine upper cover of the engine cover so that air can circulate downward in the upstream side duct, the downstream side duct being fixed to the engine in parallel with the upstream side duct so that air can circulate upward in the downstream side duct;

the upstream side duct comprises an exhaust port which is opened at a side face of the upstream side duct;

the downstream side duct comprises a downstream side lower duct and a downstream side upper duct, the downstream side lower duct extending upward so as to form an air ascending flow, the downstream side lower duct comprising a suction port provided at a position opposed to the exhaust port and separately at a predetermined distance from the exhaust port, the downstream side upper duct being formed toward the throttle body of the engine above the downstream side lower duct, the downward side upper duct comprising an exhaust port communicating with the throttle body; and

the upstream side duct and the downstream side duct are formed so as not to interfere with each other when the engine upper cover of the engine cover is moved vertically.

2. The outboard motor according to claim **1**, wherein:

the upstream side duct is formed by:

an upstream side upper duct which is fixed to an upper portion of the engine upper cover to thereby form an upper space; and

an upstream side lower duct which is fixed to a lower face of the upstream side upper duct to thereby form an air descending flow space between the upstream side lower duct and the engine upper cover, and which comprises the exhaust port opened at a side face of the upstream side lower duct.

3. The outboard motor according to claim **2**, wherein:

a lower end of the upstream side duct is opened downward.

4. The outboard motor according to claim **1**, wherein:

the upstream side duct comprises:

an upstream side upper duct which is fixed to an upper portion of the engine upper cover to form an upper space; and

an upstream side lower duct which is formed below the upstream side upper duct to extend downward to a rear lower portion of the engine;

an upper suction port which communicates with the outside air intake port through the intake space is formed at the upstream side upper duct; and

the exhaust port is provided at a side face of the upstream side lower duct.

5. The outboard motor according to claim **4**, wherein:

the upper suction port is opened upward, a rising portion is formed to surround the upper suction port, and the upstream side upper duct is formed to be slanted downward to the outside air intake port.

6. The outboard motor according to claim **4**, wherein:

a lower end of the upstream side duct is opened downward.

7. The outboard motor according to claim **1**, wherein:

a lower end of the upstream side duct is opened downward.

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